I. INTRODUCTION

A. This course provides the student with an introduction to the basic principles and repair of automatic transmissions, torque converters, and planetary gear systems.

B. Power Trains II (DEMR 1447) is a required course for the completion of a two year Associate of Applied Science degree in Diesel Engine Mechanic and Repairer or a Level I or Level II certificate of completion in the Diesel Technician Program.

C. This course is occupationally related and serves as a preparation for a career in the Diesel Service and Repair field.

D. Prerequisites: This course has a prerequisite or co-requisite (AAS Degree) of DEMR 1401 and DEMR 1416 or consent of the Department Chair.

E. Alphanumeric coding used throughout this module book denotes integration of SCANS occupational competencies (C1, etc.) and Foundation skills (F1, etc.).

II. LEARNING OUTCOMES

Upon successful completion of this course, Power Trains II, the student will:

1. Evaluate component failure. (C20)
2. Power flow concepts. (C19)
3. Repair power train components. (C20)
4. Explain the function of the hydraulic circuits in heavy-duty automatic transmission. (C7)
5. Explain the function of heavy-duty automatic transmission electronic controls. (C7)
6. Explain the function of power train retarders. (C7)
7. List automatic transmission and maintenance requirements. (C7)
8. Improve or design system: suggests modifications to existing systems and develop new or alternative systems to improve performance. (C17)
9. Use tools and equipment. (C18)
10. Use service publications. (C18)
11. Practice shop safety. (C19)
III. INSTRUCTIONAL MATERIALS

A. Instructional materials for this course may be found at www.ctcd.edu/books

B. Supplemental Reading: As assigned by the instructor.

C. Audio-visual aids: See resource list at end of this module book.

D. Other instructional material: as selected by the instructor.

IV. COURSE REQUIREMENTS

A. This course is being taught in a self-paced mode. It differs from the traditional college course in that you are allowed to work on your own and at your own speed within limitation. This course is 96 clock hours in length. The student may set his/her own schedule within the time frame the course is offered. You must attend class on the days and at the times you selected when you enrolled in the course.

You will have an assigned instructor. If at any time you do not understand a reading assignment, audio visual presentation or lab work, ask your instructor for assistance. He is there for you!

This module book is designed to inform you of the sequence in which this course will be presented. You must follow this sequence and you must do what the module book says. It contains reading assignments, written assignments, audio visual presentations and lab assignments that you must complete or watch. Written assignments will be turned in as directed by the instructor. Late assignments will not be accepted. You must let your instructor know when you are ready to do a learning activity, performance exam or take a scheduled exam.

B. The student must take notes when viewing DVD’s, CD’s, or videos. Exams may be taken from audio visual aids, reading and lab assignments. If instructor notes or handouts are given to you, you must study them, exams may be taken from these notes also.

C. The instructor may give written assignments or “pop” quizzes as he deems necessary.

D. Performance Exams:
Each student will clean all tools and equipment that they use and properly store them and clean their work area after the completion of each task.
All lab work will be completed on an individual basis. The student will receive a “pass” or “fail” on the task. Students who fail to complete a task correctly to industry standards must repeat the task. The instructor will date and initial each performance exam task as it is satisfactorily completed.

E. The following is part of the course requirements: Each student will assist in lab clean-up at the close of the evening classes and will assist in unloading and storing supply shipments. Failure to do so will result in a failure to complete all course requirements and the student could receive an “N” for the course.

F. There will be nine (9) written examinations in this course (8 module/unit exams and an exit exam). **Written exams must be completed before taking the performance exam for each module.** The exit exam is a comprehensive exam that covers the entire course. Certificate students must score 70% on the exit exam. Certificate students will be allowed to take the exit exam a maximum of three (3) times. Failure to achieve a 70% score on the exit exam in three (3) tries will result in an "N" for the course and the student must retake the course.

G. The student must complete the written assignments to receive a grade. **Written assignments for each unit will be turned into the instructor prior to starting performance exams for that module.**

H. If you have special needs because of learning disabilities or other kinds of disabilities, please feel free to discuss this with the instructor. The instructor will attempt to meet your needs with the assistance of counselors, tutors (Project Mainstream), and the assistance of the Disabilities Services Office. Program/course integrity will not be sacrificed. Students must meet all course requirements.

**GRADING**

Students will be graded using the standard Skills Center "Pass-Fail" system used for self-paced programs. To satisfactorily complete the written exams, the student must score 80% on tests (except the exit exam, 70%). Students who fail to make the 80% on any exam (except the exit exam) must retake the exam. The current test re-take policy will apply to all certificate students. The student must satisfactory complete all written and performance exams to receive a passing grade ("P").

**V. NOTES AND ADDITIONAL INSTRUCTIONS FROM THE COURSE INSTRUCTOR**

A. **Course Withdrawal:** It is the student’s responsibility to officially withdraw from a course if circumstances prevent attendance. Any student who desires to, or must, officially withdraw from a course after the first scheduled class meeting must file
a Central Texas College Application for Withdrawal (CTC Form 59). The withdrawal form must be signed by the student.

The equivalent date (75% of the semester) will be used for sessions of other lengths. The specific last day to withdraw is published each semester in the Schedule Bulletin.

A student who officially withdraws will be awarded the grade of “W” provided the student’s attendance and academic performance are satisfactory at the time of official withdrawal. Students must file a withdrawal application with the College before they may be considered for withdrawal.

A student may not withdraw from a class for which the instructor has previously issued the student a grade of “F”, “N”, “FN”, or “XN” for nonattendance.

B. Administrative Withdrawal: An administrative withdrawal may be initiated when the student fails to meet College attendance requirements. The instructor will assign the appropriate grade on CTC Form 59 for submission to the registrar.

C. Incomplete Grade: The College catalog states, “An incomplete grade ("IP") may be given in those cases where the student has completed the majority of the coursework but, because of personal illness, death in the immediate family, or military orders, the student is unable to complete the requirements for a course. . Prior approval from the instructor is required before the grade of “IP” for Incomplete is recorded. A student who merely fails to show for the final examination will receive a zero for the final and a “N” for the course.

D. Cellular Phones and Beepers: Cellular phones and beepers will be turned off while the student is in the classroom or laboratory.

E. American’s With Disabilities Act (ADA): Disability Support Services provide services to students who have appropriate documentation of a disability. Students requiring accommodations for class are responsible for contacting the Office of Disability Support Services (DSS) located on the central campus. This service is available to all students, regardless of location. Explore the website at www.ctcd.edu/disability-support for further information. Reasonable accommodations will be given in accordance with the federal and state laws through the DSS office.

F. Instructor Discretion: The instructor reserves the right of final decision in course requirements.

G. Civility: Individuals are expected to be cognizant of what a constructive educational experience is and respectful of those participating in a learning
environment. Failure to do so can result in disciplinary action up to and including expulsion.

H. Absence from the class may be unavoidable in some situations. These include illness, military/civilian job requirements, or a death in the immediate family. Documentation is required in the case of excused absences for job requirements. Excuses will be on company letterhead stationary signed by the immediate supervisor stating the reason for the absence for civilian jobs. Excuses for military personnel must be signed by the 1st Sergeant or the Company Commander. NOTE: This does not apply to VA, VA/Voc, or Financial Aid students. There are no excused absences for these students. Talk to your funding agency if you have questions.

Disability Support Services provides services to students who have appropriate documentation of a disability. Students requiring accommodations for class are responsible for contacting the Office of Disability Support Services (DSS) located on the central campus. This service is available to all students, regardless of location. Review the website at [www.ctcd.edu/disability-support](http://www.ctcd.edu/disability-support) for further information. Reasonable accommodations will be given in accordance with the federal and state laws through the DSS office.

VI. FIRST CLASS MEETING

A. The instructor will introduce the course and show the student the textbook.

B. The instructor will verify the class roster/enrollment form:

C. The instructor will have the student read and sign the course requirements sheet.

D. The instructor will discuss the following topics with the student:

1. Course requirements, objectives and how the course works
2. Policy letters
3. Student handouts
4. Laboratory Learning Activities and lab work (Learning Activities, Performance exams, competency profile)
5. Exam, grading, reading and written assignments.
6. Absences
7. Shop/classroom cleanup–tools
8. Dress code
9. Parking
10. Sign-in computer
11. Course outline/fact sheets/student handouts
12. Hazardous communications/MSDS information
13. Shop safety
I. Module 1447-01: Rear Axle Assemblies and Differential Carriers Functions and Components

A. Time:
   Certificate Student: 9 Clock Hours
   Degree Student: 1 Week

B. Module Learning Outcomes: Upon completion of this module the student will:
   1. Identify and explain the function of rear axle assemblies and differential carriers. (C7)
   2. Identify the components and explain the operating principles, types and applications of interaxle differentials and traction equalizers. (C7)
   3. Demonstrate knowledge of power train fundamentals. (C19)

C. Read Chapter 23 in Resource DEMR 1447-01. (Textbook)

D. See your instructor and ask him to explain any part of the reading assignment that you do not understand.

E. View Audio Visuels: (See your instructor) Student must take notes.
   2. View Resource DEMR 1421-23 on “Two-Speed Axle Operation.”

F. See your instructor and ask him if there is any information that should be viewed or read that pertains to this module.

G. Complete the Learning Activities listed below for this module.
   1. Complete Worksheet 1421-09-01
   2. Complete Worksheet 1421-09-02

H. Review for Module 1447-01 Written Exam. Study all previous assignments in this module. See your instructor and ask him to explain any area that you do not understand.

I. Module 1447-01 Written Exam: (See your Instructor)

J. Critique Module 1447-01 Written Exam: (See your Instructor)

K. Performance Exam Module 1447-01: Refer to the Laboratory Learning Activities (Lab Sheet) in this module book and complete the Performance Exam for this module. (See your instructor).
L. Certificate students should complete this module by the end of the 10th clock hour. Degree students must complete this module by the end of the 2nd week.

II. Module 1447-02: Differential Troubleshooting and Repair

A. Time
   Certificate student: 28 clock hours
   Degree student: 2 weeks

B. Module Learning Outcomes: Upon completion of this module the student will:
   1. Inspect, diagnose, disassemble, repair and reassemble a differential carrier. (C20)
   2. Perform visual inspection of components. (C20)
   3. Determine serviceability of components. (C20)
   4. Use tools and equipment. (C18)
   5. Use service publications. (C18)
   6. Practice shop safety. (C19)

C. Read Fact Sheet 1447-02-01.

D. Read Chapter 24 in Resource DEMR 1447-01. (Textbook)

E. See your instructor and ask him to explain any part of the reading assignment that you did not understand.

F. View Audio Visuals: (See your instructor) Student must take notes.
   1. View Resource DEMR 1421-24 on “Axle Maintenance”
   2. View Resource DEMR 1421-25 on “Axle Failure Analysis”

G. See your instructor and ask him if there is any other information that should be viewed or read that pertains to this module.

H. Complete the Learning Activities listed below for this module.
   1. Complete Worksheet 1447-01-01
   2. Complete Worksheet 1447-01-02

I. Review for Module 1447-02 Written Exam: Study all previous assignments in this module. See your instructor and ask him to explain any area that you do not understand.

J. Module 1447-02 Written Exam: (See your instructor)

K. Critique Module 1447-02 Written Exam: (See your instructor)
L. Performance Exam Module 1447-02: Refer to the Laboratory Learning Activities (Lab Sheet) in this module book and complete the Performance Exam for this module. (See your instructor)

M. Certificate students must complete this module by the end of the 20th clock hour. Degree students must complete this module by the end of the 4th week.

III. Module 1447-03: Torque Converters and Fluid Couplings

A. Time:
   Certificate student: 10 clock hours
   Degree student: 2 week

B. Module Learning Outcomes: Upon completion of this module the student will:
   1. Interpret power flow concepts. (C19)
   2. Evaluate component failures. (C20)
   3. Repair power train components. (C20)
   4. Use tools and equipment. (C18)
   5. Use service publications. (C18)
   6. Practice shop safety. (C19)

C. Read Chapter 17 in Resource DEMR 1447-01. (Textbook)

D. See your instructor and ask him to explain any part of the reading assignment that you do not understand.

E. View Audio Visuals: (See your instructor) Student must take notes.
   1. View Resource DEMR 1447-01 on “Operation of the MD Transmission Torque Converter,” Allison SA2619

F. See your instructor and ask him if there is any other information that should be viewed or read that pertains to this module.

G. Complete the Learning Activities listed below for this module.
   1. Complete Worksheet 1447-03-01
   2. Complete Worksheet 1447-03-02

H. Review for Module 1447-03 Written Exam: Study all previous assignments in this module. See your instructor and ask him to explain any area that you do not understand.

I. Module 1447-03 Written Exam: (See your Instructor)
J. Critique Module 1447-03 Written Exam: (See your Instructor)

K. Performance Exam Module 1447-03: Refer to the Laboratory Learning Activities (Lab Sheet) in this module book and complete the Performance Exam for this module. (See your instructor)

L. Certificate students must complete this module by the end of the 10th clock hour. Degree students must complete this module by the end of the 2nd week.

IV. Module 1447-04: Planetary Gearing Functions and Concepts

A. Time
Certificate student: 10 clock hours
Degree student: 2 weeks

B. Module Learning Outcomes: Upon completion of this module the student will:

1. Interpret power flow concepts. (C19)

C. Read Chapter 18 in Resource DEMR 1447-01. (Textbook)

D. See your instructor and ask him to explain any part of the reading assignment that you do not understand.

E. View audio visuals: (See your instructor) **Student must take notes.**


F. See your instructor and ask him if there is any other information that should be viewed or read that pertains to this module.

G. Complete the Learning Activities listed below for this module.

1. Complete Worksheet 1447-04-01
2. Complete Worksheet 1447-04-02

H. Review for Module 1447-04 Written exam: Study all previous assignments in this module. See your instructor and ask him to explain any area that you do not understand.

I. Module 1447-04 Written exam: (See your instructor)

J. Critique module 1447-04 Written exam: (See your instructor)
K. Performance exam module 1447-04: Refer to the Laboratory Learning Activities (Lab Sheet) in this module book and complete the Performance Exam for this module (See your instructor).

L. Certificate students must complete this module by the end of the 20th clock hour. Degree students should complete this module by the end of the 4th week.

V. Module 1447-05: Transmission Maintenance Requirements

A. Time
Certificate students: 5 Clock Hours
Degree students: 1 week

B. Module Learning Outcomes: Upon completion of this module the student will:

1. List automatic transmission maintenance requirements. (C7)

C. Read Chapter 21, paragraph 21-10 pgs. 663-665; Refer to chart Fig. 21-42

D. Read Sections 1 and 2 pgs. 1-1 through 2-16 in the Allison MD Series Transmission Service Manual SA2148C. (See your instructor)

E. See your instructor and ask him to explain any part of the reading assignment that you do not understand.

F. View Audio Visuals: (See your Instructor) Student must take notes.


2. View Resource DEMR 1447-05 on “MD Transmission Physical Description,” Allison SA2618

G. See your instructor and ask him if there is any other information that should be viewed or read that pertains to this module.

H. Complete the Learning Activities listed below for this module. (See your Instructor)

1. Complete Worksheet 1447-05-01

I. Review for Module 1447-05 Written Exam: Study all previous assignments in this module. See your instructor and ask him to explain any area that you do not understand.

J. Module 1447-05 Written Exam: (See your Instructor)
K. Critique Module 1447-05 Written Exam: (See your Instructor)

L. Performance Exam Module 1447-05 Refer to the Laboratory Learning Activities (Lab Sheet) in this module book and complete the Performance Exam for this module. (See your Instructor)

M. Certificate students must complete this module by the end of the 25\textsuperscript{th} clock hour. Degree students must complete this module by the end of the 5\textsuperscript{th} week.

VI. Module 1447-06: WT Transmission Electrohydraulics and Power Flows

A. Time
Certificate students: 20 clock hours
Degree students: 4 weeks

B. Module Learning Outcomes: Upon completion of this module the student will:

1. Interpret power flow concepts. (C19)
2. Explain the function of the hydraulic circuits in a heavy-duty automatic transmission. (C7)
3. Explain the function of heavy-duty automatic transmission electronic controls. (C7)

C. Read Chapter 21, Pgs. 635-663 (WT Modular Construction) in Resource DEMR 1447-01 (textbook).

D. Read Fact Sheet 1447-06-01.

E. See your instructor and ask him to explain any part of the reading assignment that you do not understand.

F. View Audio Visuals: (See your Instructor) Student must take notes.

2. View resource DEMR 1447-06 on “Functioning of the MD Hydraulic System,” Allison SA2623.

G. See your instructor and ask him to explain any part of the reading assignment that you do not understand.
H. Complete the Learning Activities listed below for this module. (See your Instructor)
   1. Complete Worksheet 1447-06-01
   2. Complete Worksheet 1447-06-02
   3. Complete Worksheet 1447-06-03
   4. Complete Worksheet 1447-06-04

I. Review for Module 1447-06 Written Exam: Study all previous assignments in this module. See your instructor and ask him to explain any area that you do not understand.

J. Module 1447-06 Written Exam: (See your Instructor)

K. Critique Module 1447-06 Written Exam: (See your Instructor)

L. Performance Exam Module 1447-06: Refer to the Laboratory Learning Activities (Lab Sheet) in this module book and complete the Performance Exam for this module. (See your Instructor).

M. Certificate students must complete this module by the end of the 45th clock hour. Degree students must complete this module by the end of the 9th week.

VII. Module 1447-07: Transmission Troubleshooting and Repair

A. Time
   Certificate students: 10 clock hours
   Degree students: 2 week

B. Module Learning Outcomes: Upon satisfactory completion of this module the student will:
   1. Evaluate component failures. (C20)
   2. Repair power train components. (C20)
   3. Use tools and equipment. (C20)
   4. Use service publications. (C20)
   5. Practice shop safety. (C20)

C. Read Chapter 21; Pages 643-663 (Troubleshooting WT Transmissions) in resource DEMR 1401-01 (Textbook)

D. Read Section 2-15; Pgs. 2-10 thru 2-12, Allison MD Series, Transmissions Service Manual SA2148C (See your Instructor)

E. See your Instructor and ask him to explain any part of the reading assignment that you do not understand.

F. View Audio Visuals: (See your Instructor) Students must take notes.
1. View Resource DEMR 1447-09 on “Pro-Link Diagnostic and Troubleshooting,” Allison SA3109.

G. See your instructor and ask him if there is any other information that should be viewed or read that pertains to this module.

H. Complete the Learning Activities listed below for this module. (See your Instructor)
   1. Complete Worksheet 1447-07-01
   2. Complete Worksheet 1447-07-02

I. Review for Module 1447-07 Written Exam: Study all previous assignments in this module. See your Instructor and ask him to explain any area that you do not understand.

J. Module 1447-07 Written Exam: (See your Instructor)

K. Critique Module 1447-07 Written Exam: (See your Instructor)

L. Performance Exam Module 1447-07: Refer to the Laboratory Learning Activities (Lab Sheet) in this module book and complete the Performance Exam for this module. (See your Instructor)

M. Certificate students must complete this module by the end of the 85th clock hour. Degree students must complete this module by the end of the 14th week.

VIII. Module 1447-08: Hydraulic Power Train Retarders

A. Time:
   Certificate Student: 40 Clock Hours
   Degree Student: 5 Week

B. Module Learning Outcomes: Upon satisfactory completion of this module the student will:
1. Explain the function of power train retarders. (C7)

2. Evaluate components failures. (C20)

3. Interpret power train components. (C20)

4. Repair power train components. (C20)

5. Use tools and equipment. (C18)

6. Use service publications. (C18)

7. Practice shop safety. (C18)

8. Improve or design system: suggests modifications to existing systems and develop new or alternate systems to improve performance. (C17)

C. Read Fact Sheet 1447-08-01 on Hydraulic Retarders.

D. Read Chapter 21; Pages 640-641 (Output Retarder Module)

E. Read Section 2 pages 2-15 thru 2-17 in the Allison MTB 644 Service manual (See your instructor)

F. See your instructor and ask him to explain any part of the reading assignment that you do not understand.

G. View Audio Visuals: (See your Instructor)


H. See your instructor and ask him if there is any other information that should be viewed or read that pertains to this module.

I. Complete the Learning Activities list below for this module. (See your Instructor)

1. Complete Worksheet 1447-08-01.
2. Complete Worksheet 1447-08-02
3. Complete Worksheet 1447-08-03
4. Complete Worksheet 1447-08-04

J. Review for Module 1447-08 Written Exam: Study all previous assignments in this module. See your instructor and ask him to explain any area that you do not understand.
K. Module 1447-08 Written Exam: (See your Instructor)

L. Critique Module 1447-08 Written Exam: (See your Instructor)

M. Performance Exam Module 1447-08: Refer to the Laboratory Learning Activities (Lab Sheet) in this module book and complete the Performance Exam for this module. (See your Instructor)

N. Certificate students must complete this module by the end of the 94th clock hour. Degree students must complete this module by the end of the 15th week.

IX. Module 1447: Exit Exam

A. Time
   Certificate Student: 2 Clock Hours
   Degree Student: 1 Week

B. Module Learning Outcomes: Upon satisfactory completion of this module the student will:
   1. Demonstrate SCANS and Foundation Skills
   2. Complete the exit exam

C. Review all previous assignments in this module.

D. See your instructor and ask him to explain anything that you do not understand about heavy-duty automatic power trains.

E. Module 1447 Written (exit) Exam: (See your Instructor)

F. Critique Module 1447 (exit) Exam: (See your Instructor)

G. End of the course critique and enrollment in the next course in the program. (See your instructor)

H. Certificate students must complete this module by the end of the 96th clock hour. Degree students must complete this module by the end of the 16th week.